

SUGARCANE SMUT

S.A. Alfieri, Jr.

Sugarcane smut, caused by *Ustilago scitaminea* Syd., was first noted in Natal, South Africa, in 1877. It has since been reported in most of the sugarcane-growing countries in Asia and Africa in the Eastern Hemisphere (1). The disease then appeared in Argentina in 1940, followed by reports from Hawaii, Fiji, Dominican Republic, Martinique, Brazil, Bolivia, Guyana (3), and most recently in Jamaica (7). The world distribution of sugarcane smut is illustrated in Figure 4. With Jamaica only 100 miles from Cuba, and Cuba just about 90 miles from Florida, the arrival of this serious disease on the mainland of the United States is virtually assured (7).

Sugarcane smut is a disease of major importance in sugar-producing countries of the world. Losses can range from very minor to complete loss (1). Smut-infested plants result not only in fewer canes but also in reduced sugar content (9). Sugarcane plants under stress show higher disease incidence (2). Losses due to smut are greater with primary infection vs secondary infection, early season infection vs late season infection, and with ratoon crops vs plant crops (1).

Infection of planted cuttings occurs by chlamydospores present in the soil or in irrigation water and by diseased planting stock (1). Standing cane becomes infected mainly in the buds by wind-borne spores, which are produced from smutted appendages (diseased terminal shoots of sugarcane) that are enclosed in a thin, silvery membranous sheath making up the sorus, the spore-producing structure of the fungus (1,7). As the sheath ruptures, the spores appearing like a thick layer of black soot fall to the soil surface and are also dispersed by wind and rain as well as by man (5,11) to adjacent plants and fields of sugarcane (1). One smutted appendage is estimated to produce 5 billion spores (9). A schematic illustration of the disease is shown in Figure 2, whereas Figure 3 represents the life cycle of sugarcane smut. Disease severity depends on the environmental conditions and the resistance of the sugarcane varieties grown (7).



Fig. 1. Sugarcane smut with blackened, whip-like appendage at apex of sugarcane plant (Supplied through the courtesy of Susan Kunisaki, PIQ, APHIS, USDA, Hawaii).

More than one race of the smut fungus was recently found in Taiwan (8) and Hawaii (7) attacking varieties resistant to the established race. Though most cane varieties grown in the United States are susceptible, many varieties and selected clones are being tested in Jamaica for smut resistance, since this area will most likely be the source of inoculum for introduction into the USA (7). A smut spore-laden tropical storm entering the Gulf of Mexico could inoculate all the U.S. sugarcane production areas of Florida, Louisiana, and Texas (4, 5, 6).

SYMPTOMS. Infected plants are spindly with small narrow leaves and extended internodes, and exhibit the characteristic long (up to several feet), whip-like, usually curved, silver-grey to blackened pencil-thick appendage at the apex of the affected stalk (1, 7, 9, 10, 12) as shown in Figure 1. Affected clumps of sugarcane produce an excess of tillers (10,12).

CONTROL. The recommended measures to control sugarcane smut are as follows: 1) careful roguing of diseased shoots or stools; 2) selecting healthy planting material; 3) disinfesting cuttings with Dithane or other suitable fungicides and/or disinfecting with hot water treatment at 52 C for 18 minutes prior to planting; 4) avoiding the ratooning of affected cane fields; 5) establishing a crop rotation with non-susceptible crops; and 6) planting resistant varieties (1). Hawaii, following the outbreak of sugarcane smut, required that seed be grown in a disease-free area, treated with hot water, disinfested with a fungicide, and shipped in containers treated with Lysol solution (11). A recent outbreak of sugarcane smut in a 40-acre field in Guyana was treated with an aerial application of Paraquat, a contact herbicide, to facilitate burning of the affected cane. The stubble was plowed under, and the field put under flood fallow (2). Port of entry inspections can also aid as an effective barrier against introduction of sugarcane smut.

Literature Cited

1. Antoine, R. 1961. Smut. Pages 326-345 in J. P. Martin, E. V. Abbott, and C. G. Hughes, eds. Sugarcane diseases of the world. Vol. I. Elsevier Publishing Co., New York. 542p.
2. Bates, J. F. 1975. Smut disease in Guiana. Sugarcane Path. Newsletter 13/14. p. 53-55.
3. Commonwealth Mycological Institute. 1977. *Ustilago scitaminea* Sydow. Distribution maps of plant diseases. Map 79. Ed. 4. 2p.
4. Davis, D. F. 1976. More concern for sugarcane smut arriving in Florida. USDA. ARS. Notes from the area office. Issue 18. 2p.
5. _____. 1976. Sugarcane smut in the Caribbean. USDA. ARS. Notes from the area office. Issue 21. 6p.
6. _____. 1977. Resistance to sugarcane smut studied in Jamaica. USDA. ARS. Notes from the area office. Issue 23. 4p.
7. Dean, J. L., and J. D. Miller. 1977. Sugarcane smut—a potential problem for U.S. sugarcane industries. Pages 3-4 in D. F. Davis, ed. USDA. ARS. notes from the area office. Issue 22. 6p.
8. Leu, L. S., and W. S. Teng. 1974. Culmicolous smut of sugarcane in Taiwan V. Two pathogenic strains of *Ustilago scitaminea* Syd. in J. Dick, and D. J. Collingwood, eds. Proc. 15th Congr. Int. Soc. Sugar Technol. 1:275-279. (Rev. Plant Path. 55(8):721.1976. Abstr.)
9. Mohan Rao, N. V., and P. Prakasam. 1956. Studies on sugarcane smut. Proc. Int. Soc. Sugar Cane Technol. 1:1048-1057.
10. Sharma, S. L. 1956. Morphological modifications in sugarcane plant by systemic infection of smut (*Ustilago scitaminea* Syd.) Proc. Int. Soc. Sugar Cane Technol. 1:1134-1169.
11. Steiner, G. W., R. S. Byther, J. C. Comstock, D. J. Heinz, and S. L. Ladd. 1975. Present status of smut in Hawaii. Sugarcane Path. Newsletter 13/14. 26p.
12. Wakker, J. H., and F.A.F.C. Went. 1898. De Ziekten van het suikerriet of Java. [The diseases of sugar-cane in Java] E. J. Brill, Leiden, The Netherlands. 217p.

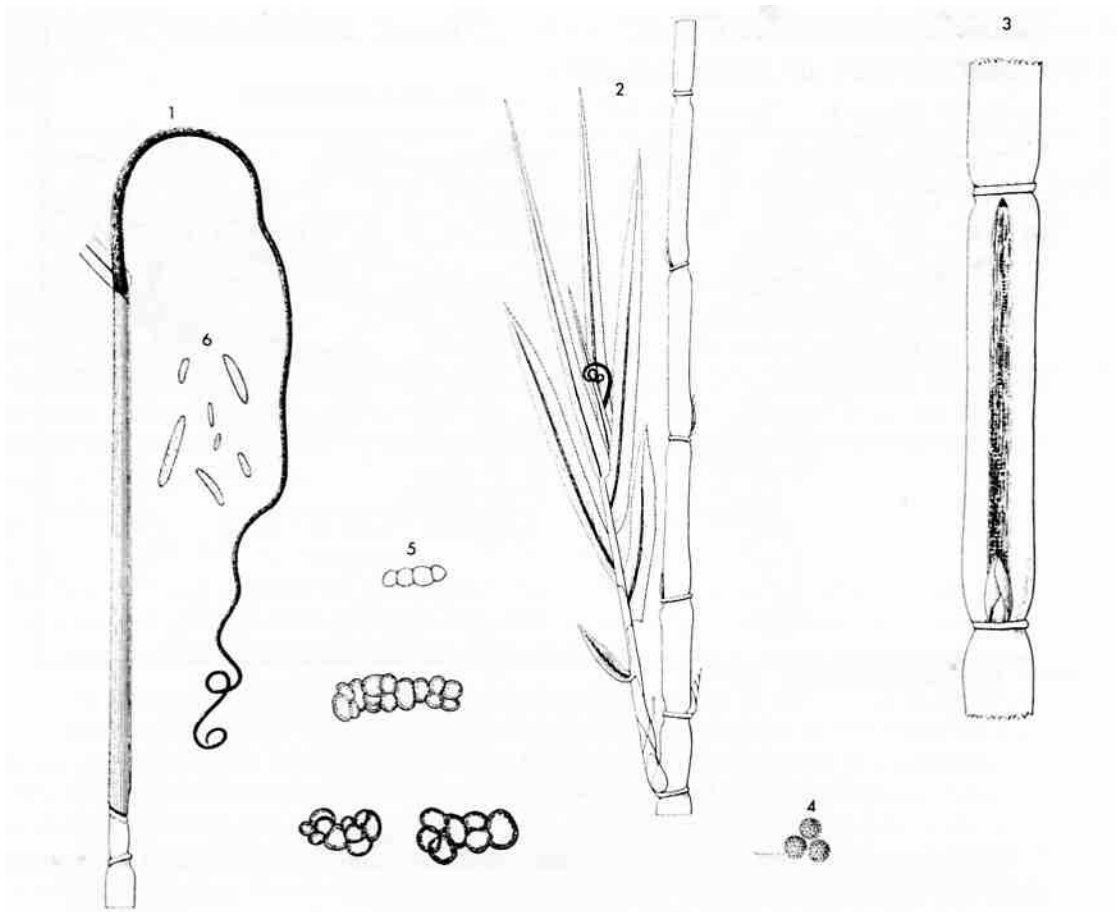


Fig. 2. Sugarcane smut, *Ustilago scitaminea* Syd.: 1) smutted tip of stalk; 2) stalk with smutted sprout; 3) section of diseased stalk with elongated deep eye groove and elongated pointed bud; 4) chlamydospores of the fungus; 5) dusters of chlamydospores; 6) sporidia of fungus. (After J. H. Wakker and F.A.F.C. Went in "Die Ziekten van het Suikerriet of Java. 1898: The diseases of sugar-cane in Java, 1898).

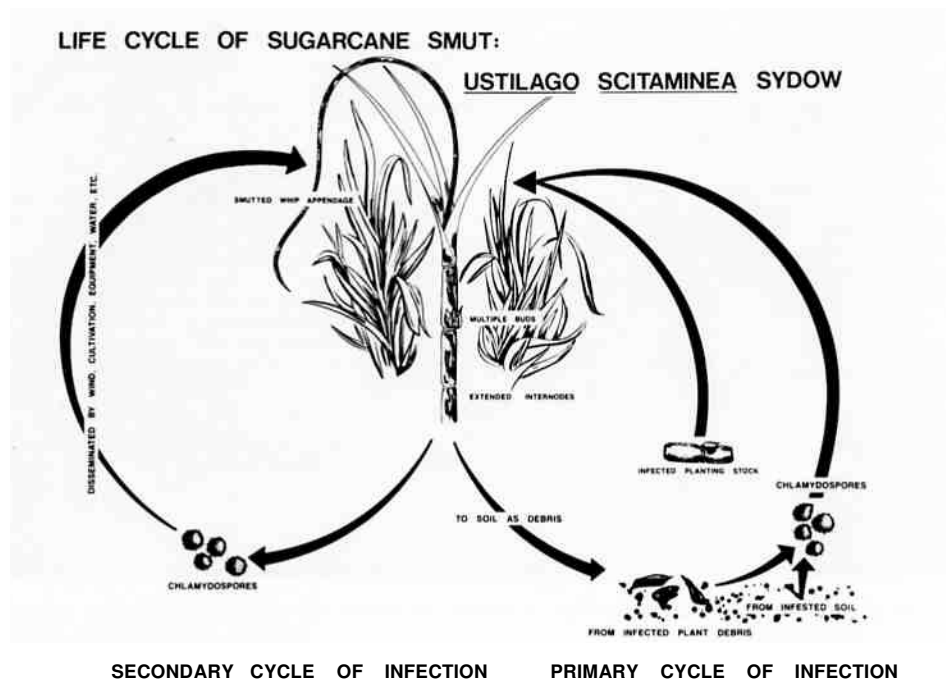
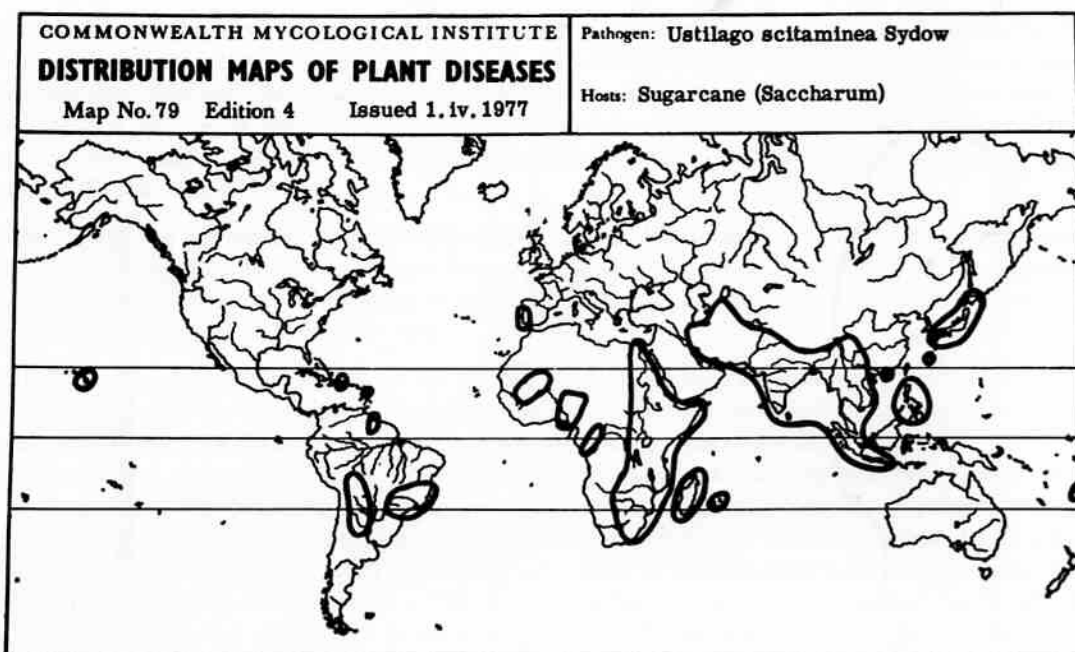


Fig. 3. Life cycle of *Ustilago scitaminea* Syd., the cause of sugarcane smut.



© Commonwealth Agricultural Bureaux 1977

Map No. 79 Edition 4

AFRICA

Congo [50, 915y]
 •Egypt [Stevenson & Rands, 18:203]
 Ethiopia [ISSCT list, 41:872]
 •Kenya
 Malagasy Republic [Nossi Be, 15:607]
 •Malawi [47, 39Bc]
 Mali [Inter-African Phytosan. Bull. 5:1, 1973]
 Mauritius [5:695]
 Mozambique [38:397]
 Nigeria [49, 1570]
 Reunion [Stevenson & Rands, loc. cit.]
 Rhodesia [28:196]
 Somalia [ISSCT list loc. cit.]
 •South Africa (Natal) [24:290; Zundel, 27:704]
 •Sudan [48, 3137k]
 Tanzania [42:77]
 Uganda [ISSCT list, 43, 218]
 •Zambia [45, 772]

ASIA

Afghanistan [38:659; ISSCT list, 41, 672]
 Burma [4:259]
 Cambodia [49, 3732]
 China (Canton, Szechwan) [12:724; Lee Ling, Host index of parasitic fungi of Szechwan :22]
 •Hong Kong [43, 345]
 Indonesia [48, 2278]
 Iran [53, 1527]
 Japan [46, 1510]
 •Malaysia (W) [48, 3137k]
 •Okinawa [ISSCT list loc. cit.]
 •Pakistan [Ali, 39:658]
 Philippines [2:89]
 Sri Lanka [29:79]
 Thailand [ISSCT list, 36:275; 45, 1168]

Vietnam [11:432; ISSCT list loc. cit.]
 USSR (Turkestan) [Zaprometoff, 8:238; ISSCT list, loc. cit.]

AUSTRALASIA & OCEANIA

Fiji [52, 659]
 Hawaii [51, 2812; 52, 2011]

EUROPE

Portugal [9:489]

CENTRAL AMERICA & WEST INDIES

Dominican Republic [38:450]
 Martinique [55, 4842]

SOUTH AMERICA

Argentina (Tucuman) [21:5]
 Bolivia (Rio Chico) [37:208]
 Brazil (Minas Geraes, Sao Paulo, Rio de Janeiro) [45, 1178
 1496; 52, 3813]
 •Guyana [N.W. Simmonds in litt. July, 1975; 55, 867, 4842]

NOTE: The var. *sacchari-barberi* Mundkur has been recorded from: ? Argentina (Tucuman) [24:74]; India [19:238; 20:596]; Mauritius [19:238], the var. *sacchari-officinarum* Mundkur has been recorded from: ? Argentina (Tucuman) [24:74]; China [19:238]; India [19:238]; Philippines [19:238]; see CMI Descript. 80. *U. scitaminea* has been recorded for Australia (Qd) but is not present [fide A. F. Bell in litt. 10.8.44]. Records for Trinidad are extremely doubtful [see Baker & Dale, 30:489]. A record for Taiwan [Shirai & Hara, 7:672] is presumed erroneous since *U. scitaminea* has been reported intercepted twice in this country: Leu & Tsai, Sugarcane Path Newsl. 2:8, 1968; Leu, Tsai & Yan, Ibid 11/12:26, 1974.

•Specimens in Herb. IMI
 Numbers in square brackets e.g. [54, 1234] refer to abstracts in the Review of Plant Pathology

Fig. 4. World distribution of sugarcane smut.